

CLAIMS

41. A method of automatically cutting out and unloading stacks of pieces from a lay-up made up of superposed layers of sheet material, the method comprising:

cutting out stacks of pieces from the lay-up on a cutting table on the basis of recorded information relating to the locations of the pieces on the surface of the lay-up;

unloading the stacks of pieces by means of at least one unloading tool that is controlled automatically;

splitting up the skeleton of the lay-up into a plurality of portions while the stacks of pieces are being cut out on the cutting table;

progressively bringing the lay-up onto an unloading table with the stacks of cut-out pieces and the skeleton of the lay-up not separated from one another; and

successively unloading the stacks of cut-out pieces by using the information relating to the locations of the pieces to move the unloading tool adjacent to the stacks on the unloading table and to take off each stack from the remainder of the lay-up by moving the stacks substantially parallel to the plane of the lay-up, without interfering with the stacks of pieces that have not yet been unloaded, stacks of cut-out pieces and portions of the skeleton of the lay-up being unloaded in a manner such as to clear the way on the unloading table for the stacks of pieces that have not yet been unloaded.

42. A method according to claim 41, whereby the stacks of pieces slide over the unloading table.

43. A method according to claim 42, whereby, while the stacks of pieces are being moved over the unloading table, the stacks of pieces are supported by a cushion of air.

ad 44. A method according to claim 41, whereby the stacks of pieces roll over the unloading table.

45. A method according to any one of claims 42, 43, or 44, whereby each stack of pieces is driven over the unloading table by bringing the unloading tool to bear against the surface of the stack and by moving said tool.

46. A method according to claim 41, whereby, after each stack of pieces has been taken off from the remainder of the lay-up, each stack of pieces is accompanied by the unloading tool to a collector device.

47. A method according to claim 41, whereby, after each stack of pieces has been taken off from the remainder of the lay-up, each stack of pieces is propelled by the unloading tool to a collector device.

48. A method according to claim 46 or 47, whereby the unloaded stacks of pieces are directed to at least one collector device to form predetermined sets of pieces.

49. A method according to any one of claims 46 or 47, whereby the unloaded stacks of pieces are directed to at least one collector bin.

50. A method according to claim 46 or 47, whereby the unloaded stacks of pieces are directed to a collector device to form therein at least one queue ordered in a predetermined manner.

51. A method according to claim 41, whereby at least some of the portions of the skeleton of the lay-up are removed automatically from the unloading table.

52. A method according to claim 51, whereby at least portions of the skeleton that are situated along the longitudinal edges of the lay-up are removed from the unloading table by automatic removal means that are distinct from the unloading tool.

53. A method according to claim 41, whereby each set of a plurality of adjacent stacks of pieces in the lay-up where the pieces have shapes such that they are mutually interlocking is unloaded as a single stack of pieces.

54. A method according to claim 41, whereby each stack of pieces of size smaller than a minimum predetermined value is included in a non-fragmented portion of the lay-up skeleton, the resulting set of pieces and skeleton being unloaded as a single stack.

55. A method according to claim 41, in which the lay-up is covered with a plastic film prior to cutting out the stacks of pieces, such that, prior to removing the stacks of pieces from the unloading table, the portion of plastics film cut out with each stack of pieces and situated on each stack is taken off automatically.

56. A method according to claim 55, whereby each portion of plastic film situated on each stack of cut-out pieces is taken off by means of the unloading tool and then removed.

57. A method according to claim 55 or 56, whereby the portion of plastic film is taken off by suction.

58. A method according to claim 41, whereby the unloaded stacks of pieces are wrapped individually.

59. A method according to claim 41, whereby the unloaded stacks of pieces are marked.

60. A method according to claim 59, whereby the marking is performed by marking means carried by the unloading tool, before the stacks of pieces are removed from the unloading table.

61. A method according to claim 58 or 59, whereby the marking is performed after the stacks of pieces have been wrapped.

62. A method according to claim 41, whereby unloading and removal information is stored that is associated with the stacks of pieces and with at least some of the portions of the skeleton, each item of said information comprising:

- an unloading or removal rank;

- an item of pick-up information relating to the location to which the unloading tool should be brought on the stack of pieces or on the portion of skeleton;

- take-off information comprising information relating to a slide direction to be followed by the stack of pieces or by the portion of skeleton; and

- an unloading or removal address.

63. An installation for automatically cutting out and unloading stacks of pieces from a lay-up made up of superposed layers of sheet material, the installation comprising:

- a cutting table;

- a conveyor for moving a lay-up over the cutting table;

- a cutting tool;

- a carriage for moving the cutting tool above the cutting table;

- a control unit connected to the conveyor and carriage in order to move the cutting tool and a lay-up, carried by the conveyor, relative to each other in order to cut out stacks of pieces from the lay-up as a function of stored lay-out information relating to the locations of the pieces to be cut out on the surface of the lay-up;

- at least one unloading tool for automatically unloading stacks of cut-out pieces;

- an unloading tool support for moving the unloading tool and connected to the control unit in order to move the unloading tool adjacent to the stacks of cut-out pieces to be unloaded;

- an unloading table above which the unloading tool may be moved, the control unit being organized for:

- controlling the relative movements between the cutting tool and the lay-up carried by the conveyor in order to cut up the skeleton of the lay-up into a plurality of portions; and

- controlling the movements of the unloading tool in order to move the unloading tool into contact with the stacks of cut-out pieces that arrive with a lay-up on a surface of the unloading table situated downstream from the cutting table, and to take off the stacks of cut-out pieces successively from the remainder of the lay-up by moving them over the unloading table and by moving them substantially parallel to the surface of the unloading table.

64. An installation according to claim 63, whereby the surface of the unloading table has a plurality of orifices, and the unloading table is connected to a blower so that it can support the stacks of cut-out pieces via a cushion of air.

65. An installation according to claim 64, whereby the unloading table is subdivided into a plurality of sectors suitable for being connected selectively to the blower.

66. An installation according to claim 63, whereby the surface of the unloading table is provided with rolling beads.

67. An installation according to claim 63, whereby the installation further comprises a plurality of cutting tables, an unloading table, and means for moving the unloading table in order to bring the unloading table selectively to the ends of respective ones of the cutting tables.

68. An installation according to claim 63, whereby the unloading tool is mounted to move between a raised position and a lowered position so that the unloading tool comes to bear against the top surface of a stack of cut-out pieces by being moved from its raised position to its lowered position.

69. An installation according to claim 63, whereby the unloading tool is mounted on the unloading tool support which moves parallel to the surface of the unloading table, the unloading tool further being mounted to rotate relative to the unloading tool support about an axis perpendicular to the surface of the unloading table.

70. An installation according to claim 63, whereby the unloading table is provided with at least one finger suitable for being brought into contact with a top surface of a stack of cut-out pieces to be unloaded.

71. An installation according to claim 70, whereby the unloading tool being provided with a plurality of fingers between which the spacing is variable.

72. An installation according to claim 63, whereby the unloading tool is provided with a suction device.

73. An installation according to claim 63, whereby the unloading tool is provided with sweeper for sweeping the surface of the unloading table.

74. An installation according to claim 63, whereby the unloading tool is provided with a retractable needle for engaging the stacks of pieces.

75. An installation according to claim 63, whereby the unloading tool is provided with a marker for marking the stacks of pieces.

76. An installation according to claim 63, whereby the installation further comprises a collector for receiving stacks of cut-out pieces unloaded from the unloading table.

77. An installation according to claim 76, whereby the collector comprises a bin adjacent to the unloading table.

78. An installation according to claim 77, whereby the collector comprises at least one conveyor mounted to move along one side or end of or under the unloading table.

79. An installation according to claim 63, whereby the installation further comprises removal tools distinct from the unloading tool for removing the cut-up portions of the lay-up skeleton from the unloading table.

80. An installation according to claim 79, whereby the removal tools are disposed at least in part laterally relative to the unloading table.